LBNE Conceptual Design Report

Volume X: Guidance On Writing

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Contents

List of Figures

List of Tables

1 Guidelines for Writting a CDR Volume

This document provides guidelines for writing an LBNE CDR Volume. It includes instructions on how to provide the best quality figures and gives brief examples of the majority of what little LaTeX one needs to know.

Real CDR volumes will have multiple chapters, sections and subsections that are defined by the editor and to be filled in by designated subject matter experts.

2 Providing the best Figures you can

Providing the right formats for figures is important in order to keep the image quality high while managing the memory footprint of the document. Formats and file content should be chosen to retain image quality during the scaling that can occur with on-screen viewing or printing. It is common for authors to not understand or appreciate how to provide figures in the best applicable format. This section hopes to provide that understanding and guidance. If you want to just skip to the guidance go to section **??**.

2.1 Raster vs. Vector

Raster image data define the color of each pixel in a fixed sized image. Vector image data describes the image with graphics primitive objects such as lines, curves and gradient fills.

Scaling raster image data from its native size will reduce the quality by producing minor artifacts or in the worse case significantly altering the displayed image and even making it completely incomprehensible. Vector image data can, in principle, be infinitely scaled with no loss of quality.

The only image type that must use raster image data are photographs or photo-realistic renderings. All others should be provided in vector image data. Failing to do so will result in suboptimal quality.

2.2 Image Data vs. File Format

The most popular file formats for holding vector image data are PDF and PS (or EPS). However, these file formats can also hold raster image data. Providing raster image data in these container formats does not magically turn the data into vectors.

To check if a PDF or PS/EPS file contains vector or raster data simply view it at high zoom levels. If you can ever discern individual image pixels larger than native display/printing

pixels you have raster data.

2.3 JPEG compression

JPEG compression works by performing a spatial Fourier transform on the image, throwing away the transform coefficients for high frequencies and storing the rest. When displayed, the inverse transform is performed. This compression results in the loss of information. Most photographs tend to have few high frequency components and an acceptable image can be produced while reducing the file size considerably. For "line art" such as plots or drawings the result will contain many artifacts such as shadowing, ghosting and color changes.

2.4 Rules to live by

Adhere to these rules and you will provide the highest quality images:

1. The only image type to ever store in JPEG format is photographic.
2. All other image types should be provided as vector image data.
3. Using PDF and PS/EPS file formats does not imply the underlying image data are vectors.
4. When producing original drawings or plots, always save the results as vector image data in either PDF or PS/EPS directly from the application.
5. If any photo-manipulation is required avoid introducing high frequency elements (such as lines with gradient-free edges), save any intermediate results in the native application format and save the final results as JPEG.
6. Never convert a file from one format to another (the editors will do this if required). This is particularly important if you fail to produce native vector image data and are stuck with raster. It is preferable to submit the original raster format than to "convert" it into PDF.

2.5 Examples of best practices

2.5.1 Annotating

It is common to want to take some figure or image and add additional information such as arrows or text. How to best handle this depends on what the original image is, what kind of annotations are needed and what software one has access to.

In general, start and end with the same format. For example, if the original is JPEG then end with a JPEG. If additional annotations are needed it is best to save intermediate files in a format that keeps the annotation information separate from the original. Be wary of any application that violates the rules to live by in section 2.4.

To annotate JPEG, one can use PowerPoint/OpenOffice, XFIG, DIA. These let one save intermediate files that preserve the differences between annotation and original JPEG information. To annotate PDF, one can use Acrobat, Inkscape, Foxit, pdftops+Xfig, pdfedit. To annotate PS, one can use Illustrator, Xfig, skencil, Inkscape.

2.6 A note on images in LaTeX

This section is mostly for editors. There are two common ways to build a LaTeX document. One uses `latex` to produce a DVI file followed by a DVI converter to produce PS or PDF. The other uses `pdflatex` to directly produce a PDF file. These two methods have different image format requirements. For the first, all images must be in EPS format while the second can take PDF, JPEG or PNG (but you wouldn't ever use PNG because you follow the directions in section **??**, right?!).

To support both build chains one has to follow two rules:

1. Always leave off the file extension when specifying the file to the `\includegraphics{}` macro. `latex`/`pdflatex` will chose the best available format.
2. If an image is not already in EPS format, provide one by converting what file you do have. If one only has the image in EPS format, convert it into PDF format.

For producing EPS from a JPEG original, by far the best utility is "jpeg2ps"*. This will embed the JPEG without conversion directly into EPS. At the time of writing, all other known converters will convert the JPEG so that each pixel is described in PS. This inflates the file size immensely.

Converting between EPS and PDF can be accomplished with a variety of tools. The command line programs `epstopdf` and `pdftops` perform adequately.

Bibliography

*`http://www.pdflib.com/download/free-software/jpeg2ps/`

3 Some of the LaTeX you will need

This section describes the majority of LaTeX[1] needed.

3.1 Sectioning

The following sectioning macros are available, ordered in descending importance:

```
\chapter{A Chapter}
\section{A Section}
\subsection{A Sub Section}
\subsubsection{A Sub Sub Section}
\subsubsubsection{A Sub Sub Sub Section}
\subsubsubsubsection{A Sub Sub Sub Sub Section}
```

Starting from `\subsection`, this produces the following:

3.1.1 A Sub Section

3.1.1.1 A Sub Sub Section

3.1.1.1.1 A Sub Sub Sub Section

3.1.1.1.1.1 A Sub Sub Sub Sub Section

3.2 Figures

See next section for guidelines in providing the best possible figures. Any graphics element is included using this command:

```
\includegraphics[OPTIONS]{volume-X-dummy/figures/myfigurefile}
```

All figures should be put in a subdirectory of the volume directory. The file should be referenced **with no file extension**. This allows both `latex` and `pdflatex` to be used by providing file formats compatible with each.

The `OPTIONS` most likely used will be to scale the graphic to a sensible size. Examples:

```
\includegraphics[width=0.5\textwidth]{...}
\includegraphics[height=0.1\textheight]{...}
```

Figures should include a number, reference label and caption. These are included using this environment:

```
\begin{figure}[h]
  \centering
  \includegraphics[width=\textwidth]{volume-X-dummy/figures/LargeCavity}
  \caption{Drawing of large cavity and nearby excavation.}
  \label{fig:large-cavity}
\end{figure}
```

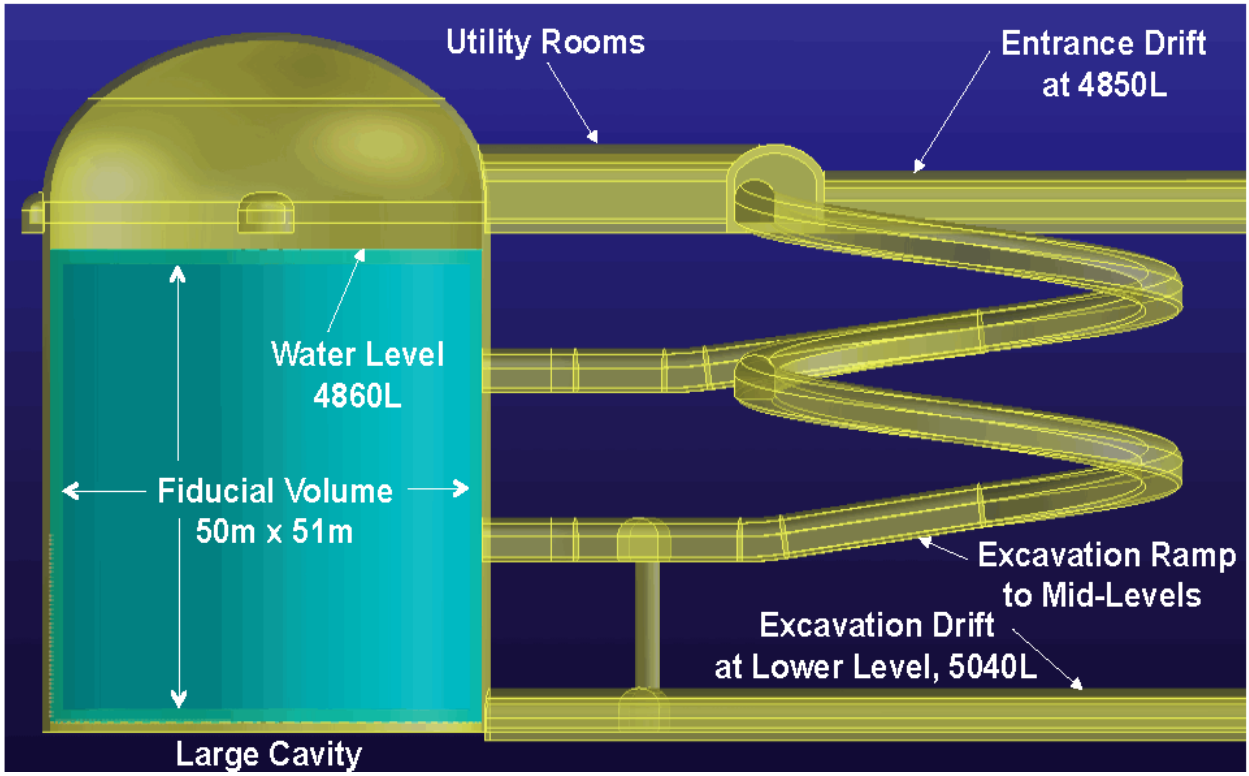

Fig. 3.1. Drawing of large cavity and nearby excavation.

3.3 Tables

```
\begin{tabular}[h]{|r|c|l|}
  \hline
  Column1 & Column2 & Column3 \\
  \hline
  thing1 & thing2 & thing 3 \\
  \hline
\end{tabular}
```

Column1	Column2	Column3
thing1	thing2	thing 3

3.4 Referencing

After any section or within any figure or table environment that will be referenced one should define a label to use for the reference

```
\chapter{Some Chapter}
\label{ch:some-chapter}

\subsection{Some Sub Section}
\label{subsec:some-sub-section}

...

As described in chapter~\ref{ch:some-chapter} ...
```

Examples for figures and tables have been given above.

3.5 Lists

Various lists types can be made.

3.5.1 Bullets

```
\begin{itemize}
\item Item 1
\item Item 2
\item Item 3
\end{itemize}
```

- Item 1
- Item 2
- Item 3

3.5.2 Numbers

```
\begin{enumerate}
\item Item 1
\item Item 2
\item Item 3
\end{enumerate}
```

1. Item 1

2. Item 2

3. Item 3

3.5.3 Descriptions

```
\begin{description}
\item[Item A] is item A
\item[Item B] is item B
\item[Item C] is item C
\end{description}
```

Item A is item A

Item B is item B

Item C is item C

Bibliography

[1] Leslie Lamport. *LaTeX: A Document Preparation System*. Addison-Wesley, 1986.

4 Handling Bibliography Stuff

We use BibTeX[1] for the bibliography.

4.1 Making Citations

Use the usual `\cite{label}` in the body of the text to reference something. This label must be used in the .bib data base (see next).

4.2 Bibliography Entries

Add entries to the top level `cdr/refs.bib` file.

4.3 Putting the Chapter bib

To place each chapter bib put a `\putbib` as the last thing.

Bibliography

[1] Oren Patashnik. Using BibTeX. Documentation for general BibTeX users, January 1988.

THE END

Bibliography

[1] Leslie Lamport. *LaTeX: A Document Preparation System*. Addison-Wesley, 1986.

[2] Oren Patashnik. Using BibTeX. Documentation for general BibTeX users, January 1988.